TECHNICAL NOTES

U. S. DEPARTMENT OF AGRICULTURE IOWA STATE OFFICE
NATURAL RESOURCES CONSERVATION SERVICE DES MOINES, IOWA

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Subject: FORAGE MANAGEMENT IN A GRAZING SYSTEM

This technical note provides basic information on managing forages in a livestock grazing system. It will review Minimum Forage Heights, Leaf Area, and the relationship between root growth and forage heights.

Livestock grazing systems are based upon providing adequate quantity and quality of forage to grazing livestock. The sustainability of a grazing system is based upon proper management of the forage in the system. This begins with selecting the proper species to be included in the grazing system. To assist in selecting the proper species, refer to the Pasture and Hay Planting Standard (512) and Agronomy Technical Note 34.

Plant growth is affected by many factors: soil texture and depth, rainfall, temperature, topography and the type of plant. However, if all of these factors are suitable the plant will still not be able to grow without its food producing factory - ***leaves***. The following items in this technical note discuss the management of the grazing system that will determine the size of the factory. That is the only factor in total control of the producer. This technical note will review the following topics: Minimum Forage Heights, Leaf Area, Grazing and Rest Periods.

Minimum Forage Heights

Plants use their leaves to capture the sunlight and conduct photosynthesis. The plant uses this process to manufacture carbohydrates. These carbohydrates are used by the plant for growth and maintenance. Carbohydrates produced in excess of what the plant currently needs are stored in the lower leaves and the root system for future use. Plants grazed to no more than the minimum forage heights will result in the plant being able to re-grow its leaves mostly through the photosynthesis process. When plants are grazed below the minimum forage height, the plant will need to use too many of the carbohydrates stored in its root system to re-grow. Primary functions of the roots are to anchor the plant in the soil and to absorb water and minerals in addition to storing surplus food. Excess removal of leaves depletes the root system and makes the plant more vulnerable to other stresses such as drought and competition from other plant species. Table 1 provides guidance to minimum forage heights of the more common plant species utilized in Iowa grazing systems.

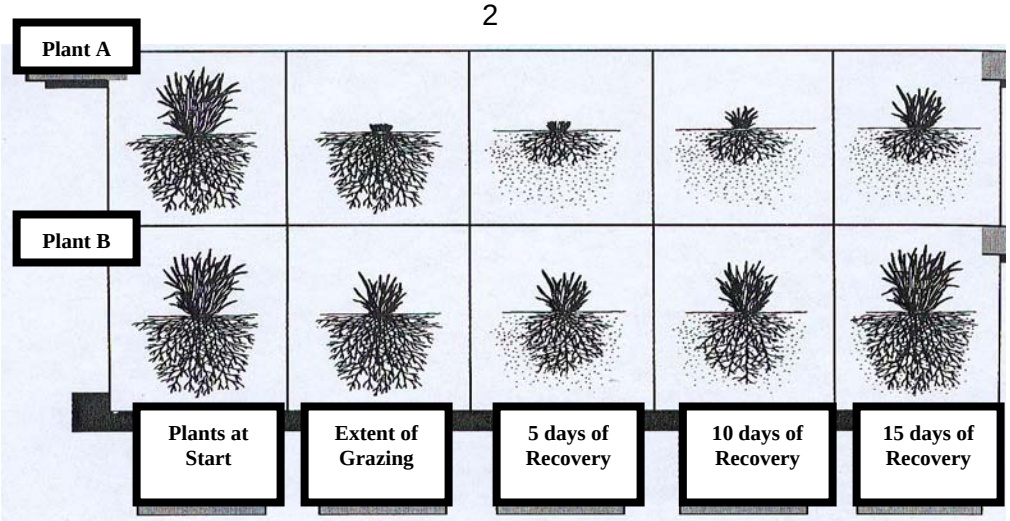

Figure 38-3 *The amount of leaf removed in a grazing affects the rate at which the plant regrows. Plant B loses far less leaf than plant A and thus draws less energy from roots, stem bases, and crowns. Less root is killed and it begins to regrow almost immediately.*

TABLE 1

GRAZING MANAGEMENT

	Begin Grazing	End Grazing	
	Minimum Height Vegetative Growth 2/ 5/ 6/	Minimum Stubble Height	Minimum Regrowth Before Killing Frost 3/ 4/
Forage 1/	Inches	Inches	Inches
Kentucky Bluegrass	4-6	2	4
Orchardgrass	6-10	4	6
Bromegrass	6-12	4	6
Tall Fescue	6-10	4	6
Reed Canarygrass	8-10	4	6
Timothy	6-10	3	5
Switchgrass	16-20	6	6
Indiangrass	12-16	6	6
Big Bluestem	10-16	6	6
Eastern Gamma Grass	10-16	8	8
Birdsfoot Trefoil	6-10	4	6
Red clover (1st grazing)	¼ - ½ bloom	2	--
Red clover (2nd grazing)	¼ bloom	2	8
Alfalfa 4/ (1st grazing)	Full Bud	2	--
Alfalfa 4/ (2nd and 3rd grazing)	¼ bloom	2	10
Crownvetch	8-10	3	6

1/ Grass and legume mixture should be grazed in a manner that favor the dominant or desired species.
2/ Height is average height when leaves are lifted in vertical position.
3/ At end of growing season, minimum regrowth is the critical factor that determines end of grazing except on pastures grazed only in fall and winter. When a grazing period ends, there should be photosynthetic residual remaining adequate to support vigorous regrowth. Less regrowth may be beneficial if frost seeding or interseeding will be accomplished prior to the next grazing season.
4/ The last harvest of alfalfa, for pasture or hayland, should be made 35 to 45 days prior to the time when the first freeze normally occurs.
5/ In a rotational grazing system, spring grazing can be initiated when cool season forages have approximately 75% of their height as shown above. Livestock will need to be moved more rapidly until they are in a paddock where forage has grown to the desired height.
6/ If forages are exceeding the "Begin Grazing" heights consideration should be given to making hay or mowing these paddocks.

A common grazing strategy is to “take half leave half”. In other words remove half of the leaves or less in a grazing cycle and leave half of the leaves. This concept keeps the factory running and will cause minimal root growth stoppage to the plant. Table 2 illustrates this concept.

Table 2

Percent leaf volume removed	Results In	Percent root growth stoppage
10% - 40%		0%
50%		2-4%
60%		50%
70%		78%
>80%		100%

For a more detailed discussion about plant growth and the relationship between plant growth and root development refer to *GRASS: The stockman’s crop How to harvest more of it* and *Understanding Grass Growth: The Key To Profitable Livestock Production* and *NRCS Range and Pasture Handbook.*

There are situations where management strategies encourage grazing forages to a level shorter than shown in Table 1. To interseed forages into an existing stand it is beneficial to graze existing forage below the minimum forage heights to prepare the field for interseeding. This “overgrazing” will open the canopy and make it easier to get better seed soil contact with interseeding or frost seeding. It will cause stress to existing forage and give the interseeded species a better opportunity to compete the following spring.

Pastures that have been over grazed as part of a management strategy need to have grazing deferred for an extended period of time during its prime growing season. This can be a part of a grazing plan in a managed grazing system. This might be very appropriate on Conservation Reserve Program (CRP) acres utilized for managed grazing. It can also be utilized to help control undesirable vegetation in sites with wildlife as a primary objective.

Leaf Area

The previous section discussed the importance of maintaining minimum forage heights. This is the critical parameter in pasture management where regrowth is possible and desirable. It also discussed how the management of forage heights can influence the composition of the forage in the grazing system. In either scenario the amount of leaf available to capture the sunlight directly affects the growth of the plant. This is the one factor a producer can control without substantial outside inputs.

Leaf area is the amount of leaf necessary to intercept enough sunlight to maintain maximum photosynthetic activity. Different forages require different residual heights to maintain adequate leaf area to intercept full sunlight. Bluegrass can attain this at 2 inches but bromegrass needs 4 inches. When the stored carbohydrates needed for initial growth have been replaced, the leaf area exceeds what is needed for

production and the pasture is ready for grazing. This occurs when the "begin grazing" forage heights shown in Table 1 have been achieved for the specified forage. As the forage height decreases, due to livestock grazing, the forage height is reduced back towards the "end grazing" height as shown in Table 1, and the leaf area also decreases. The plant has provided the forage for the grazing animal in excess of what was needed for the photosynthetic process for regrowth. But at the minimum grazing height, grazing needs to stop so that there is adequate leaf area to begin the plant's regrowth cycle. In a continuously grazed system, more leaf area needs to be available because the plants do not get an opportunity to rest.

Grazing and Rest Periods

The art of maintaining minimum forage heights and having a good leaf area is the combination of grazing and rest periods. The livestock should not begin grazing until the forage has met the forage height as shown in Table 1. The livestock need to be removed before the forage has gotten to the minimum forage height to end the grazing cycle. This process will maintain a good leaf area.

An exception to the beginning grazing height is in the early spring as the grazing season is initiated. Waiting until the forage has achieved the minimum grazing height in the first paddock to initiate grazing will result in the producer being behind the forage growth and much of it will be in the seed head stage prior to grazing. To initiate the spring grazing season, in a rotational grazing system, livestock can begin grazing when the forage is at approximately 75% of the minimum height to begin grazing. In a rotational system, early spring growth requires faster movement of the livestock and shorter rest periods. As plant growth slows during the season, the plants need a longer rest period.

The length of rest periods needed depends upon many factors but the plant species and season of the year will greatly affect the time the plants need to rest. Table 3 provides some estimates of rest periods needed depending upon whether the forage is cool season grass, cool season grass and legume, or warm season grass. Table 3 can be used as a guide, but decisions on length of grazing and rest periods need to be based upon the weather factors during the year.

Table 3

Grass and legumes need recovery time after being grazed. The following are some guidelines:

Cool Season Grass	14 – 16 days during the first rotation (April) 20 – 30 days during fast growth (May – mid June) 30 – 40 days during slow growth (summer or cold) 20 – 30 days during fall
Legumes	24 – 32 days throughout the growing season 40 – 45 days for seed production
Warm Season Grass	21 – 28 days during normal growing conditions 35 – 45 days during slower growth

Figure 38-3 on page 2 shows how a plant is affected with two different types of grazing management. It graphically illustrates the importance of maintaining minimum forage heights, having adequate leaf area and allowing for the plant to have an adequate rest period.

In addition to publications previously sited, information from the following publications was used. *Pasture Management Guide for Northern Missouri 1998; 1996 Missouri Grazing Manual; Creating a Prescribed Grazing Plan - Arkansas NRCS Technical Note September 2006; Pasture Management Guide for Livestock Producers 2005, Iowa State University.*